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Aberdeen Proving Ground

MARYLAND

A TEST OF GUN, MACHINE, LIGHT, CAL

CALIBER .30, T161E2

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DEVELOPMENT AND PROOF SERVICES

27th Report OCO Project No. TS2-2023

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~~TWENTY-SEVENTH REPORT ON PROJECT NO. TS2-2023~~

(10) L.F. Moore

(11) 4 Apr 55

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DEVELOPMENT AND PROOF SERVICES
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MARYLAND

AUTHORITY: ORDTS

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LFMoore/ncj
4 April 1955

A TEST OF GUN, MACHINE, LIGHT, CALIBER .30, T161E2

TWENTY-SEVENTH REPORT ON PROJECT NO. TS2-2023

DATES OF TEST: 27 DECEMBER 1954 TO 25 FEBRUARY 1955

OBJECT

To determine the effect on performance of modifications made on the T161E2 Gun.

SUMMARY

Two guns were subjected to function, dust, extreme-cold, rain and barrel-performance tests.

CONCLUSIONS

An improvement in endurance performance was demonstrated as the result of modifications made on the T161E2 Gun.

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I INTRODUCTION

A. DISCUSSION

The T161E2 caliber .30 light machine guns previously tested at this station gave poor functioning and endurance performance when subjected to some adverse-conditions tests. Some modifications have been made on these guns in an attempt to improve their performance. It is desired to determine if the modifications made have improved the performance of the weapons.

B. REFERENCES

1. Authority for conducting this test is contained in ORDTS (Bonkemeyer) teletype ORD 34178, a copy of which is attached as Appendix A.

2. Technical References

a. Seventeenth Report on Project TS2-2023.
A Test of Guns, Machine, Light, Caliber .30, T52E3 and T161E1.

b. Twenty-Second Report on Project TS2-2023.
A Test of Gun, Machine, Light, Caliber .30, T161E2.

c. Twenty-Sixth Report on Project TS2-2023.
A Test of Gun, Machine, Light, Caliber .30, T161E2.

II DESCRIPTION OF MATERIEL

A. The major modification on the T161E2 light machine gun is the elimination of the front roller from the operating rod assembly. This roller gave breakages in previous tests. This modification reduces the total number of parts in the weapon by two and it permits a stronger operating rod yoke since the cross-sectional area of the yoke is greater at a point where a breakage occurred on several yokes in previous tests. An operating spring having a three-wire construction is employed.

B. The ammunition used in this test was Cartridge, Ball, Caliber .30, T104E2, lot FA X30-2200. The following information on this lot was furnished by Frankford Arsenal:

CASE:	Ctg, Brass, FATIE3, Dwg. FB 25449
BULLET:	Ball, Cal. .30, FAT21, Dwg. FB 30500
PRIMER:	Rem. No. 39, Dwg. FB 13185, MP-104
POWDER:	WB 846.2, Chg: 46.2 grs.
VELOCITY:	2741 f/s
PRESSURE:	46,200 psi.
MFG.:	Frankford Arsenal, Nov. 1954

C. Links, metallic, caliber .30, T55, furnished by Springfield Armory, were used in this test.

D. The lubricant used in all phases of this test, except the rain phase, was oil, lubricating, preservative, special (PS), SPEC. JAN-L-644, Stock No. 14-O-2834-10, manufactured by the American Oil and Supply Company, Newark, New Jersey. Lubriplate was used in the rain test.

E. In the barrel-performance test the T161E2 guns were fired from Mount, Tripod, Caliber .30, T178, Serial No. 00 (manufactured by the Bridge Tool and Die Works). It was necessary to make adapters for mounting this gun since it was designed for a T52 gun which has a shorter distance between mounting holes than does the T161E2 gun.

F. A tripod mount was furnished by Springfield Armory for the barrel-performance retest. The T161E2 guns were assembled to this mount without modifications.

III DETAILS OF TEST

A. PROCEDURES

Two T161E2 light machine guns were submitted and were subjected to the following tests:

1. Each gun was subjected to a 2000-round function test. Firing was conducted using 200-round belts fed from [illegible] boxes specially constructed for this round and supplied by Frankford Arsenal. The gun was permitted to cool after firing each 200 rounds and the weapon was lightly lubricated without disassembly.

2. Each gun was subjected to two special dust tests using the standard test equipment.

a. On the first special dust test the gun was cleaned, lightly lubricated, and subjected to the dust with the bolt in the forward position and with a 50-round belt in the feedway. After removing the gun from the dust box the cover was raised, the ammunition was removed, and an attempt was made to free the gun and ammunition of dust by wiping and blowing, and by shaking the gun and ammunition. The bolt group was retracted and released several times prior to firing.

b. On the second special dust test the gun was cleaned, lightly lubricated, and subjected to the dust with the bolt in the forward position and with a 50-round belt in the feedway. After removing the gun from the dust box an attempt was made to free the gun and ammunition of dust by wiping and blowing and by shaking the gun and ammunition.

c. When subjected to the dust the guns were placed in the dust box and exposed to the dust for one minute top side up and for one minute upside down. The dust mixture, which is made up by mixing nine pounds of Grade O Albany sand with one pound of clean silica core sand which passed 100 percent through a 30 mesh sieve, 80 percent through a 50 mesh, and 3.4 per cent through a 100 mesh, was poured at a rate of five pounds per minute through the pour hole while the blower was turned at a handle-speed of 60 revolutions per minute.

3. Each gun was subjected to an extreme-cold test. The guns were cleaned, lightly lubricated and placed, with ammunition, in a cold room, maintained at -65°F, for a twelve-hour period prior to firing. After this period an attempt was made to fire 20 rounds.

4. Each gun was subjected to the standard rain test. The guns were cleaned, lubricated with Lubriplate, and subjected to spray which was directed over the entire gun by means of a 1/2-inch pipe having 0.059-inch holes spaced 1/2 inch apart. The pipe was positioned three feet above the gun. The following procedure was used:

a. The gun, in a horizontal position, was exposed to the spray for ten minutes with the bolt retracted. The gun was loaded after the gun had been exposed to the spray for five minutes. After the ten-minute exposure the gun was fired 100 rounds in short bursts.

b. The procedure in "a" was repeated except that 100 rounds were fired in one burst.

c. The procedure in "a" was repeated except that the gun was exposed to the spray with muzzle up. The gun was fired 100 rounds in short bursts from the horizontal position. Before firing, the muzzle of the gun was depressed to permit water accumulating in the bore to run out.

d. The procedure in "c" was repeated except that the gun was fired 100 rounds in one burst.

e. The procedure in "c" was repeated except that the gun was exposed to the spray with muzzle down.

f. The procedure in "d" was repeated except that the gun was exposed to the spray with muzzle down.

5. One gun was subjected to the following barrel-performance test:

a. With sights properly adjusted, four ten-round targets were fired single shot at a range of 100 yards with the gun assembled to a tripod mount.

b. The gun was fired from a tripod mount at a rate of 125 rounds per minute. It was attempted to fire a total of 5000 rounds.

6. The second gun was subjected to a barrel-performance test having a different firing schedule than the first. In this test the gun was fired at a rate of 250 rounds per minute until the barrel failed. The gun was assembled to a tripod mount.

7. The two guns were again subjected to the 5000-round barrel-performance test after the barrels and other broken and damaged parts had been replaced. The firing in this test was done from a tripod mount furnished by Springfield Armory.

B. RESULTS

1. Round-by-round data will be found in Appendix B.

2. Summaries of the various tests follow:

a. FUNCTION TEST

Number of stoppages in firing 2000 rounds from each gun under normal conditions:

GUN SERIAL NUMBER	NUMBER OF STOPPAGES
17	0
19	7

b. DUST TESTS

Dust test in which the cover was raised, the ammunition removed from the gun, and an attempt made to clean the gun and ammunition by blowing, shaking and wiping. Number of stoppages in firing 50 rounds from each gun:

GUN SERIAL NUMBER	NUMBER OF STOPPAGES
17	40
19	6

Dust test in which the cover was not raised and the ammunition was not removed from the gun but an attempt was made to clean the gun and ammunition by blowing, shaking and wiping. Number of stoppages in firing 50 rounds from each gun:

GUN SERIAL NUMBER	NUMBER OF STOPPAGES
17	45
19	38

c. EXTREME-COLD TEST

Number of stoppages in firing 20 rounds from each gun after gun and ammunition had been subjected to a temperature of -65°F. for a period of 12 hours:

GUN SERIAL NUMBER	NUMBER OF STOPPAGES
17	2
19	0

d. RAIN TEST

Number of stoppages in firing 600 rounds from each gun when subjected to the standard rain test:

GUN SERIAL NUMBER	NUMBER OF STOPPAGES
17	283
19	102

e. BARREL-PERFORMANCE TESTS

(1) Gun serial number 17 was fired a total of 3574 rounds at a rate of 125 rounds per minute when a bullet went through the side of the barrel.

(2) Gun serial number 19 was fired a total of 1699 rounds at a rate of 250 rounds per minute when a bullet went through the side of the barrel.

(3) Gun serial number 17 was placed in good operating condition and fired a total of 3679 rounds at a rate of 125 rounds per minute when a stoppage occurred in which the bolt could not be retracted in a normal manner because of a broken operating rod yoke. The gun was abandoned because of the possibility of danger to the gunner. The barrel was bent downward to cause a change of 12.1 inches in the center of impact at 100 yards.

(4) Gun serial number 19 was placed in good operating condition and fired 5000 rounds at a rate of 125 rounds per minute. The barrel was bent downward to cause a change of 20.0 inches in the center of impact at 100 yards.

C. OBSERVATIONS

1. The history of the guns used in this test is not known. However, the guns were inspected before firing this test and it was found that they had previously fired a considerable number of rounds.

2. The links used in this test were covered with a moderate to heavy coat of oil when received. This oil was not removed prior to use of the links and it may have affected the operation of the gun as well as to prevent stretched cases.

3. It was difficult to retract the operating parts, especially in the dust test, because of the heavy operating rod spring and the friction between the operating parts and the receiver. The cocking lever has a handle which is poorly designed for repeated retraction of the operating parts. The gunner injured his hand in retracting the operating parts in the dust test. The diameter of the handle is too small to accommodate the hand comfortably and it is too short to accommodate two fingers without danger of catching the skin of the hand between the lever and the receiver. It was determined that an average force of 44 pounds was required to retract the cocking lever after the weapons had completed the barrel-performance tests. This force is too great to be applied conveniently with one finger. The gunners wore heavy gloves during the rain and barrel-performance tests.

4. The functioning performance of the T161E2 guns in this test was comparable with that obtained in the previous test. This indicates that the elimination of the front operating rod roller does not affect the functioning performance greatly. While a large number of breakages occurred in conducting the barrel-performance tests, the over-all endurance performance was better than that previously obtained because of the redesigned operating rod assembly. Two operating rod yokes broke in the vicinity of the remaining roller in the barrel-performance retests. Each of these rods had previously fired about 10,000 rounds. Much of this firing was conducted under an unfavorable schedule. The roller and pin which were entirely eliminated in the redesign of the rod assembly gave unsatisfactory endurance in previous tests.

5. A major redesign of the weapon will probably be required in order to obtain appreciably improved functioning performance in the adverse-conditions tests. The dust tests to which these guns were subjected were less severe than the standard dust test. In the standard dust test the gun is exposed to the dust in firing condition (gun is loaded and the safety is placed in the ON position). When in firing condition the bolt on the T161E2 gun is at the rear and foreign matter is free to enter the receiver and chamber. The mechanism of a belt-fed weapon is more exposed to foreign matter than one on a magazine-fed weapon because openings must be provided for the ammunition belt and for the ejected links. Additional foreign matter is carried into the gun with the ammunition during firing. The solution to the dust problem would appear to be to first determine the severity of the dust condition in which the gun is expected to function and then modify the gun to the required degree to give satisfactory performance. The easiest approach would probably be to control the amount of foreign matter which enters the mechanism. It may be found that the use of covers over the case and link ejection ports would exclude sufficient foreign matter to permit satisfactory functioning. Poor functioning performance is obtained in the rain test because water enters the gas system and a loss in power results. It may be found necessary to employ a different type of gas system in order to obtain satisfactory functioning in the rain test.

6. While the barrel-performance tests were conducted under good light conditions (about mid-day with an overcast sky) considerable flash was observed at various points.

a. After firing about 800 rounds at a rate of 250 rounds per minute in gun number 19 and about 2700 rounds at a rate of 125 rounds per minute in gun number 17, a large muzzle flash was observed.

b. A continuous flame was observed at the breech at one point in firing gun number 17.

c. A continuous flame at the rear of the gas cylinder was observed after firing about 1300 rounds at a rate of 250 rounds per minute in gun number 19 and after firing about 2700 rounds at a rate of 125 rounds per minute in gun number 17.

d. The covering on the barrel cover and hand guard on gun number 19 burst into flames after firing about 1000 rounds at a rate of 250 rounds per minute.

7. The barrel-performance tests were fired with the guns assembled to a T178 tripod mount. Because of flexing of the legs on the mount during firing, the ammunition belt, which was fed from a box on the ground, slapped against the side of the gun with considerable force. The gunner's hand would probably have been injured had it not been covered.

8. Photographs showing the barrels and other parts which failed in the barrel-performance tests are attached as Appendix C. The barrel on gun number 17 was inspected after the barrel-performance test. The barrel had a series of deformations starting in the liner a few inches forward of the chamber which indicate that the bullets were deflected from side to side as they passed down the bore. This condition apparently became worse as the test progressed until the point of a bullet dug into the left side of the barrel sufficiently to cause it to spin and pass through the right-hand side of the barrel.

9. The barrel-performance retests were fired from a tripod mount furnished by Springfield Armory. The mount had several extremely poor design features.

a. After completion of the second barrel-performance retest, one leg fell off the mount. A rolled pin having a cross-sectional area of 0.005 square inch was employed to retain the locking lever to the bolt which passes through the leg and tripod base. On inspection it was found that two other pins were also broken so that, had the gun been fired for an extended period, all three legs would have fallen off.

b. A special locking device is employed to retain the pins which secure the gun to the mount. A ball protrudes from each side of the pin when a spring-loaded plunger is in its normal position. One of these balls disassembled from a pin assembly during this test.

[redacted]

c. The windage control knob is located on the right-hand side near the center of the mount. Its location makes adjusting inconvenient when the gunner is in firing position.

d. A large vertical movement of the mount was observed during firing.

D. OBSERVERS

DATE	NAME	REPRESENTING
30 Dec. 1954	Major C. R. Baker	Canadian Army
30 Dec. 1954	Major C. A. J. Hamilton	Canadian Army
30 Dec. 1954	Major H. H. Cooksey	Office of Chief of Ordnance
3 Jan. 1955	Mr. S. Dunford	Inland Division of General Motors Corporation
9 Feb. 1955	Capt. R. W. Schreck	Springfield Armory

IV CONCLUSIONS

The functioning performance of the modified T161E2 light machine gun was comparable with that obtained in the previous test of the T161E2 gun. An improvement in endurance was demonstrated.

V RECOMMENDATION

None.

L. F. Moore
L. F. MOORE
Proof Director

APPROVED:

T. F. COLLERAN
Director
Development and Proof Services

BENJAMIN S. GOODWIN
Chief
Arms and Ammunition Division

[redacted]

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<u>APPENDICES</u>

APPENDIX A - Directive Teletype

APPENDIX B - Test Data

APPENDIX C - APG Photographs

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APPENDIX A

Directive Teletype

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DA GRNC

29 Dec 54
ACTION TO BE TAKEN BY
D&PS

FROM ORDTS BONKEMEYER TT ORD 34178 FONECON GUSTAFSON-BONKEMEYER CMM REQUEST 2 T161E2 MACHINE GUNS ON HAND SMALL ARMS BRANCH CMM YOUR STATION CMM BE FIRED AS FOLLOWS CLN EACH GUN 2000 RDS NORMAL ENDURANCE PD EACH GUN COLD CMM RAIN AND DUST TEST PD 1 GUN 5000 RDS AT 125 RPM OTHER GUN 250 RDS RPM UNTIL KEYHOLING OR UNTIL GUN BECOMES INOPERABLE PD COSTS CHARGEABLE TO PROJECT TS2-2023 CMM PRIORITY 1-A

CFN ORD34178 2 T161E2 2000 1 5000 125 250 TS2-2023 1-A

28/2211Z

14

APPENDIX B

Test Data

LEGEND

FF - Failure to feed

FJ - Failure to eject

BLE - Bolt lacked sufficient energy to force round from magazine

FFR - Failure to fire

SAT - Satisfactory

FUNCTION REPORT

GUN NO. 17

NO.RDS. FIRED	TOTAL NO.OF RDS.FIRED ON TEST	TYPE FIRE	FUNCTION	REMARKS
			GUN, Light Machine, Caliber .30, T161E2, Serial No. 17	
			Firing Pin protrusion, 0.039 in.	
			Headspace, 1.559 in.	
			Free length of operating rod spring, 23.9 in.	
			Considerable amount of metal fouling in bore.	
			Space between liner and main barrel completely filled with fouling at several points.	
			Lands on liner and those on main barrel are not in alignment.	
			Flash suppressor cracked between prongs at one point.	
			Considerable burring on operating rod at point of contact with bolt.	
			BARREL NUMBER 168	
			CARTRIDGE, Ball, Caliber .30, T104E2, Lot FA X30-2200	
			LINK, Metallic, Caliber .30, T55	
27 December 1954			FUNCTION TEST	
			Fired from bench rest.	
200	200		Short Bursts	SAT
			Fired from prone position with bipod.	
200	400		One burst	SAT Cyclic rate 536 rds. per min.
			Fired from bench rest.	
200	600		Short bursts	SAT
200	800		One burst	SAT
200	1000		Short bursts	SAT
200	1200		One burst	SAT
200	1400		Short bursts	SAT
200	1600		One burst	SAT
200	1800		Short bursts	SAT
28 December				
200	2000		One burst	SAT A continuous flash at the breech for about 20 rounds was observed after about 150 rounds had been fired.

SPECIAL DUST TEST

The gun was cleaned, lightly lubricated, and subjected to the dust with the bolt in the forward position and with a 50-round belt in the feedway. After removing the gun from the dust box the cover was raised, the ammunition was removed, and an attempt was made to free the gun and ammunition of dust by wiping and blowing, and by shaking the gun and ammunition. The bolt group was retracted and released several times prior to firing.

50	2050	—	40-FF	Belt partially separated at two points when gunner attempted to clean it.

FUNCTION REPORT

NO.RDS. FIRED	TOTAL NO.OF RDS.FIRED ON TEST	TYPE FIRE	FUNCTION	REMARKS
			SPECIAL DUST TEST	
50	2100	----	3- FFR 36- FF 6- BIE	Light indentation of firing pin in primer of two rounds.
			COLD TEST	
			29 December 1954	
			Gun cleaned, lightly lubricated, and subjected to a temperature of -65°F for a 12-hour period.	
			Lock washer for rear gas cylinder nut broken (two lugs were broken off and the ring was broken at one point).	
			30 December	
20	2120	One burst*	1- BLE 1- FF	Cover could not be closed after firing
			An inspection after firing showed that the cover latch lever had moved out of position permitting cover latch to rotate so that it did not engage cover. Parts were reassembled and lever peened.	
			RAIN TEST	
			Gun cleaned, lubricated with Lubriplate, and subjected to the rain test.	
			Gun subjected to spray in a horizontal position.	
100	2220	Short bursts	SAT	
100	2320	One burst	SAT	
			Gun subjected to spray with muzzle up.	
100	2420	Short bursts	70- FF	Uncontrolled fire resulted on several occasions.
100	2520	One burst	27- FF 1- BLE	Belt separated at one point in moving gun into firing position.
			Gun subjected to spray with muzzle down.	
100	2620	Short bursts	75- FF 11- FJ	Uncontrolled fire resulted on one occasion.
100	2720	One burst*	87- FF 12- FJ	

*Except for malfunctions

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FUNCTION REPORT

TIME	NO. RDS. FIRED	NO. RDS. ON BBL. PERF. TEST	TOTAL NO. RDS. FIRED ON TEST	TYPE FIRE	FUNCTION	REMARKS
						Gun cleaned and lubricated. Retaining ring for cartridge guide shaft broken. Retaining ring for feed plate roller shaft disassembled permitting shaft to move forward. Rear feed plate roller disassembled from gun.
3 January 1955						
						BARREL-PERFORMANCE TEST
						New lock washer for rear gas cylinder nut installed. Rear feed plate roller and retaining rings from gun number 19 installed to make a complete weapon. Fired from Mount, Tripod, Caliber .30, T178 (Manufactured by Bridge Tool and Die Works)
	40		2760	Single shot	SAT	Accuracy Test
						WEATHER DATA: (From ARG Meteorological Branch) TEMPERATURE: 45 to 47°F. HUMIDITY: 35 to 38 percent. WIND: SSE to SSW, 3 to 4 mph. SKY CONDITION: Overcast
1334	125	125	2885	One burst	SAT	
1335	125	250	3010	" "	SAT	
1336	125	375	3135	One burst*	1- FJ	
1337	125	500	3260	One burst	SAT	
1338	125	625	3385	" "	SAT	Heavy smoke from barrel cover
1339	125	750	3510	" "	SAT	
1340	125	875	3635	" "	SAT	
1341	125	1000	3760	" " *	1- FF	Stoppage caused by belt separation
1342	125	1125	3885	" "	SAT	
1343	125	1250	4010	" "	SAT	
1344	125	1375	4135	" "	SAT	
1345	125	1500	4260	" "	SAT	Continuous breech flash for part of burst.
1346	125	1625	4385	" "	SAT	
1347	125	1750	4510	" "	SAT	
1348 to 1350	125	1875	4635	" "	1- FJ	Cover latch lever moved out of position permitting cover latch to rotate out of position. Cover could not be latched. Cover from gun number 19 installed.
1350	125	2000	4760	One burst*	1- FJ	
1351	125	2125	4885	" burst	SAT	
1352	125	2250	5010	" burst	SAT	
1352	125	2375	5135	" "	SAT	
1353	125	2500	5260	" burst*	1- FJ	
1354	125	2625	5385	" burst	SAT	
1355	125	2750	5510	" "	SAT	Continuous flash at rear of gas cylinder. Large muzzle flash.

* Except for malfunction

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FUNCTION REPORT

TIME	NO. RDS. FIRED	NO. RDS. ON BBL. PERF.TEST	TOTAL NO. RDS.FIRED ON TEST	TYPE FIRE	FUNCTION	REMARKS
1356	125	2875	5635	one burst	SAT	
1357	125	3000	5760	" "	SAT	
1358	125	3125	5885	" "	SAT	Right bipod leg fell down.
1359	125	3250	6010	" "	SAT	Covering on barrel cover cracked at several points.
1400	125	3375	6135	" "	SAT	
1401	125	3500	6260	" "	SAT	
1402	74	3574	6334	" " *	1- FF	Stoppage caused by belt separation

Firing discontinued when bullet went through right side of barrel seven inches to rear of muzzle.

Gun inspected after cooling.
Heavy fouling on operating parts and throughout inside of receiver.
An accumulation of paper particles from cartridge and brass chips observed in bottom of receiver.
Front gas cylinder nut loose and lugs broken from lock washer.
About one fourth of covering on barrel cover removed.
Piston does not move freely within gas cylinder.
Barrel is bent downward and to the right.
Barrel was removed from receiver after firing and it could be reassembled after it had cooled but the barrel lock could not be operated.
Flash hider broken at three points between prongs.
Crack in operating rod yoke at rear of pin.
Lugs broken from rear gas cylinder nut lock washer.
Increase in burring on operating rod yoke at point of contact with bolt.
Free length of operating rod spring, 22.7 in.
Headspace, 1.561 in.
Firing pin protrusion, 0.039 in.

9 February 1955

BARREL-PERFORMANCE RETEST

BARREL NO. 191 installed.
Headspace, 1.562 in. Firing pin protrusion, 0.039 in.
Bore inspected with a borescope.
Considerable chromium plating has been removed from chamber, especially at shoulders, and in main bore on driving edge of lands. Plating was also removed at a large number of small points throughout bore.
Bore eroded ahead of gas port. Some metal fouling in bore.
Recess between liner and main bore filled with metal fouling.
Rifling in liner does not align with that in main bore.
New operating rod spring installed (Spring No. 52)
Free length of new operating rod spring, 24.7 in.

GUN fired from MOUNT, Tripod, Springfield Armory Model.

40	6374	Single shot	SAT	Accuracy Test.

* Except for malfunctions

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FUNCTION REPORT

TIME	NO. RDS. FIRED	NO. RDS. ON BBL. PERF.TEST	TOTAL NO. RDS.FIRED ON TEST	TYPE FIRE	FUNCTION	REMARKS
		WEATHER DATA: (From APG Meteorological Branch)				
		TEMPERATURE: 40 to 42°F.			HUMIDITY: 53 to 60 per cent.	
		WIND: SW to SSW, 10 mph.			SKY CONDITION: Clear	
1259	125	125	6499	One burst	SAT	
1300	125	250	6624	" "	SAT	
1301	125	375	6749	" "	SAT	
1302	125	500	6874	" "	SAT	
1303	125	625	6999	" "	SAT	Considerable smoke at breech.
1304	125	750	7124	" "	SAT	
1305	125	875	7249	" "	SAT	
1306	125	1000	7374	" "	SAT	
1307	125	1125	7499	" "	SAT	
1308	125	1250	7624	" "	SAT	
1309	125	1375	7749	" " *	1- FJ	Cover could not be closed after malfunction because latch had rotated out of position. Cover replaced.
1310	125	1500	7874	" "	SAT	
1311	125	1625	7999	" "	SAT	
1312	125	1750	8124	" "	SAT	
1313	125	1875	8249	" "	SAT	
1314	125	2000	8374	" "	SAT	Heavy smoke at breech
1315	125	2125	8499	" "	SAT	
1316	125	2250	8624	" "	SAT	
1317	125	2375	8749	" "	SAT	
1318	125	2500	8874	" "	SAT	
1319	125	2625	8999	" "	SAT	
1320	125	2750	9124	" "	SAT	
1321	125	2875	9249	" "	SAT	
1322	125	3000	9374	" "	SAT	
1323	125	3125	9499	" "	SAT	
1324	125	3250	9624	" "	SAT	
1325	125	3375	9749	" "	SAT	
1326	125	3500	9874	" "	SAT	
1327	125	3625	9999	" "	SAT	
1328	54	3679	10053	" Burst*	1- FJ	

The bolt could not be retracted in a normal manner after the stoppage. The bolt was not locked out it was forward far enough to prevent inspection of the chamber when the cover was raised. Therefore, since there was a possibility of a live round in the chamber, the gun was abandoned.

*Except for stoppage

FUNCTION REPORT

TIME	NO. RDS. FIRED	NO. RDS. ON BBL. PERF. TEST	TOTAL NO. RDS. FIRED ON TEST	TYPE FIRE	FUNCTION	REMARKS

After cooling, the operating parts were forced from the receiver. The operating rod yoke was found to be broken.
The cocking lever slide screw disassembled from the gun during firing.
Free length of operating rod spring, 23.9 inches
The firing pin spring was broken and wedged inside the firing pin rear bearing.
There was a large amount of fouling in the mechanism.

11 February 1955

Bore inspected with a borescope.
Heavy deposit of metal fouling, especially in forward section of bore.
No metal fouling in recess between liner and main bore.
Bore badly eroded ahead of liner and ahead of gas port.
The barrel was bent downward.
New operating rod, firing pin spring and firing pin rear bearing installed.

40		10093	Single shot	SAT	Accuracy Test.

The firing pin spring and firing pin rear bearing were removed from the gun.

10		10103	one burst	SAT
50		10153	" "	SAT

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FUNCTION REPORT

GUN NO. 19

TIME	NO. RDS. FIRED	NO. RDS. ON BBL. PERF.TEST	TOTAL NO. RDS.FIRED ON TEST	TYPE FIRE	FUNCTION	REMARKS
					GUN, Light Machine, Caliber .30, T161E2, SERIAL NO. 19	
					Firing pin protrusion, 0.040 in.	
					Headspace, 1.558 in.	
					Free length of operating rod spring, 25.7 in.	
					Small amount of metal fouling in bore.	
					Considerable deposit of metal fouling between liner and main bore.	
					BARREL NO. 173	
					Cartridge, Ball, Caliber .30, T104E2, lot FA X30-2200.	
					Link, Metallic, Caliber .30, T55.	
					FUNCTION TEST	
27 December 1954						
					Fired from bench rest.	
	200		200	Short bursts	SAT	
					Fired from prone position with bipod.	
	200		400	One burst	SAT	Cyclic rate 553 rds. per min.
					Fired from bench rest.	
	200		600	Short bursts	1- FF	Failure caused by separation of belt.
	200		800	One burst*	1- FJ	
	200		1000	Short bursts	SAT	
	200		1200	One burst*	2- FJ	
					1- FF	Failure to feed caused by separation of belt.
	200		1400	Short bursts	1- FJ	
	200		1600	One burst	SAT	
	200		1800	Short bursts	SAT	
28 December						
	200		2000	One burst	1- FJ	
					SPECIAL DUST TEST	
					The gun was cleaned, lightly lubricated, and subjected to the dust with the bolt in the forward position and with a 50-round belt in the feedway. After removing the gun from the dust box the cover was raised, the ammunition was removed, and an attempt was made to free the gun and ammunition of dust by wiping and blowing and by shaking the gun and ammunition. The bolt group was retracted and released several times prior to firing.	
	50		2050	----	6- BIE	

*Except for stoppages.

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FUNCTION REPORT

TIME	NO. RDS. FIRED	NO. RDS. ON BBL PERF. TEST	TOTAL NO. RDS. FIRED ON TEST	TYPE FIRE	FUNCTION	REMARKS
					SPECIAL DUST TEST	
					The gun was cleaned, lightly lubricated, and subjected to the dust with bolt in the forward position and with a 50-round belt in the feedway. After removing the gun from the dust box an attempt was made to free the gun and ammunition of dust by wiping and blowing and by shaking the gun and ammunition.	
	50	[illegible]	2100	---	32- FF 6- BLE	
					COLD TEST	
29 December 1954						
					Gun cleaned, lightly lubricated, and subjected to a temperature of -65°F. for a 12-hour period. Retaining ring for cartridge guide shaft broken. Three lugs broken from lock washer for rear gas cylinder nut.	
30 December						
	20		2120	One burst	SAT	
					RAIN TEST	
					Gun cleaned, lubricated with Lubriplate, and subjected to the rain test. Gun subjected to spray in a horizontal position.	
	100		2220	Short bursts	SAT	
	100		2320	One burst*	1- FJ	
					Gun subjected to spray with muzzle up.	
	100		2420	Short bursts	11- FF	One failure to feed was caused by a link which jammed in feed plate.
					4- BLE 1- FJ	Uncontrolled fire resulted on several occasions.
	100		2520	One burst*	7- FF 1- BLE	
					Gun subjected to spray with muzzle down.	
	100		2620	Short bursts	34- FF 6- FJ 1- BLE	Belt separated at one point in moving gun into firing position. Uncontrolled fire resulted on several occasions.
	100		2720	One burst*	23- FF 13- FJ	

*Except for malfunctions

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FUNCTION REPORT

TIME	NO. RDS. FIRED	NO.RDS. ON BBL PERF.TEST	TOTAL NO. RDS.FIRED ON TEST	TYPE FIRE	FUNCTION	REMARKS
						Gun cleaned and lubricated. Rear sight loose on receiver.
3 January 1955						
						BARREL-PERFORMANCE TEST
						Receiver peened to prevent movement between rear sight base and receiver. New lock washer for rear gas cylinder nut installed. Feed plate from gun number 17 installed.
						WEATHER DATA: (from APG Meteorological Branch) TEMPERATURE: 45 to 47°F. HUMIDITY: 35 to 38 percent. WIND: SSE to SSW, 3 to 4 mph. SKY CONDITION: Overcast
1420	250	250	2970	One burst	SAT	
1421	250	500	3220	One burst	SAT	
1422	250	750	3470	One burst	SAT	
1423	250	1000	3720	One burst	SAT	Heavy smoke from barrel cover. Barrel cover and hand guard burst into flames. Large muzzle flash.
1424	250	1250	3970	One burst	SAT	
1425	250	1500	4220	One burst	SAT	Continuous flash at rear of gas cylinder.
1426	199	1699	4419	One burst	1- FF	Barrel ruptured at two points, on opposite sides, four inches to the rear of the muzzle.
						Gun inspected after cooling. All of the covering on the barrel cover and some on the hand guard was burned off. Barrel could be removed after firing but its reassembly after cooling was difficult. Left leg of bipod was damaged (leg could not be extended) by bullet which passed through left side of barrel. Front gas cylinder nut loose and lock washer damaged. Increase in burring on operating rod yoke at point of contact with bolt.
						Free length of operating rod spring, 25.0 in. Headspace, 1.560 in. Firing pin protrusion, 0.040 in.

FUNCTION REPORT

TIME	NO. RDS. FIRED	NO.RDS. ON BBL PERF.TEST	TOTAL NO. RDS.FIRED ON TEST	TYPE FIRE	FUNCTION	REMARKS
9 February 1955						

BARREL-PERFORMANCE RETEST

BARREL NUMBER 190 Installed.
Headspace, 1.558 in. FIRING Pin protrusion, 0.040 in.
Bore inspected with a borescope.
Considerable chromium plating has been removed from chamber, especially at shoulders, and in main bore.
Bore eroded ahead of gas port.
Some metal fouling in bore.
Recess between liner and main bore filled with metal fouling.
Rifling in liner does not align with that in main bore.
New operating rod spring installed (Spring No. 71)
Free length of new operating rod spring, 24.6 in.

Gun fired from Mount, Tripod, Springfield Armory Model.

	42		4461	Single shot	SAT	Accuracy Test.

WEATHER DATA: (from ARC Meteorological Branch)
TEMPERATURE : 40 to 43°F. HUMIDITY: 63 to 71 percent.
WIND: S, 5 to 7 mph. SKY CONDITION: Clear

1511	125	125	4586	One burst	SAT	
1512	125	250	4711	One burst*	1- FF	Belt separation.
1513	125	375	4836	One burst	SAT	Front sight fell off
1514	125	500	4961	One burst	SAT	
1515	125	625	5086	One burst	SAT	
1516	125	750	5211	One burst	SAT	
1517	125	875	5336	One burst	SAT	
1518	125	1000	5461	One burst	SAT	Cocking handle fails to remain in forward position.
1519	125	1125	5586	One burst	SAT	
1520	125	1250	5711	One burst	SAT	Cocking lever slide screw was loose. Part tightened.
1521	125	1375	5836	One burst	SAT	
1522	125	1500	5961	One burst	SAT	
1523	125	1625	6086	One burst	SAT	
1524	125	1750	6211	One burst	SAT	Heavy smoke at breech and muzzle.
1525	125	1875	6336	One burst	SAT	
1526	125	2000	6461	One burst	SAT	
1527	125	2125	6586	One burst	SAT	
1528	125	2250	6711	One burst	SAT	Cocking lever slide screw fell out.
1529	125	2375	6836	One burst	SAT	Screw replaced.
1530	125	2500	6961	One burst	SAT	
1531	125	2625	7086	One burst	SAT	
1532	125	2750	7211	One burst	SAT	

*Except malfunction

FUNCTION REPORT

TIME	NO. RDS. FIRED	NO. RDS. ON BBL. PERF. TEST	TOTAL NO. RDS. FIRED ON TEST	TYPE FIRE	FUNCTION	REMARKS
1533	125	2875	7336	One burst	SAT	
1534	125	3000	7461	One burst	SAT	
1535	125	3125	7586	One burst	SAT	
1536	125	3250	7711	One burst	SAT	
1537	125	3375	7836	One burst*	1- FJ	
1538	125	3500	7961	One burst	SAT	
1539	125	3625	8086	One burst	SAT	
1540	125	3750	8211	One burst*	1- FJ	
1541	125	3875	8336	One burst	SAT	
1542	125	4000	8461	One burst	SAT	
1543	125	4125	8586	One burst	SAT	
1544	125	4250	8711	One burst	SAT	Decrease in cyclic rate noted.
1545	125	4375	8836	One burst	----	Gunner stopped firing because of an unusually heavy recoil. The buffer cap broke permitting buffer assembly and butt assembly to separate from gun. Buffer assembly replaced.
1547	125	4500	8961	One burst	SAT	
1548	125	4625	9086	One burst	SAT	
1548	125	4750	9211	One burst	SAT	
1549	125	4875	9336	One burst	SAT	
1550	125	5000	9461	One burst	SAT	Large continuous flash at breech.
	10		9471	Single shot	8- FJ	Accuracy Test. Stoppage occurred after firing two rounds. The efforts of two men were required to retract bolt after stoppages.

11 February 1955

Gun disassembled and inspected.
Bolt group very difficult to retract.
Operating rod yoke broken.
Firing pin broken.
Firing pin spring broken.
Lower rail in receiver broken.
Front gas cylinder nut washer broken.
Lugs on front gas cylinder nut lock broken off.
Piston broken and was forced out.
Barrel bent downward.
Considerable deformation of liner.
Free length of operating rod spring, 22.9 in.

There was a large amount of fouling in the mechanism.
Bore inspected with a borescope.
Heavy deposit of metal fouling, especially in forward section of bore.
Recess between liner and main bore filled with metal fouling.
Bore eroded badly ahead of gas port.

The necessary parts to put the weapon in firing condition (for single shot fire) were installed.

40		9511	Single shot	SAT	Accuracy Test

*Except for stoppage

ACCURACY TEST

DATE: 3 January 1955 RANGE: 100 Yards
FIRED FROM: Mount,Tripod, Caliber .30, T178 DIRECTION OF FIRE: S
WIND: SE to S, 4 mph TEMPERATURE: 45° F. SKY CONDITION: Overcast

CARTRIDGE: Ball, Caliber .30, T104E2, Lot FA X30-2200
GUN: Light Machine, Caliber .30, T161E2, SERIAL NO. 17

Target measurements are given in inches.

RIFLEMAN	TARGET NO.	MR	MVD	MHD	EVD	EHD	ES
		BEFORE FIRING 125 RD/MIN TEST					
Davis	1	2.7	1.9	1.5	7.8	5.1	7.8
Davis	2	2.4	1.7	1.4	7.8	3.8	7.8
Davis	3	2.3	1.8	1.1	8.6	3.9	8.7
Davis	4	2.9	1.8	1.6	10.1	6.4	10.1
AVG.		2.6	1.8	1.4	8.6	4.8	8.6

This barrel failed in the 125 round/minute test.
(A bullet passed through the side of the barrel.)

Weather data by APG Weather Station.

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ACCURACY TEST

DATES: 9 and 11 February 1955
FIRED FROM: Mount, Tripod, Springfield Armory Model.
WIND: 9 Feb. - WSW, 7 mph.
11 Feb. - SSW, 18 mph.
TEMPERATURE: 36 to 52° F.
RANGE: 100 Yards
DIRECTION OF FIRE: S.
SKY CONDITION: 9 Feb. - Clear
11 Feb. - Overcast with light rain.
CARTRIDGE: Ball, Caliber .30, T104E2, Lot FA X30-2200
GUN: Machine, Light, Caliber .30, T161E2, SERIAL NO. 17
RIFLEMAN: Davis

Target measurements are given in inches.
Ten-round Targets were fired single shot.

TARGET NUMBER	C.I. FROM CENTER OF TARGET	MR	MVD	MHD	EVD	EHD	ES
		BEFORE FIRING 125 RD/MIN TEST					
1	5.3 Right 1.8 Below	2.4	2.0	1.0	7.2	4.5	8.1
2	5.4 Right 0.2 Above	3.1	2.5	1.4	11.8	5.9	11.9
3	2.9 Right 1.5 Below	2.6	1.9	1.2	9.9	5.3	9.9
4	5.8 Right 2.5 Below	1.4	1.1	0.8	3.8	3.1	4.2
Average	4.8 Right 1.4 Below	2.4	1.9	1.1	8.2	4.7	8.5
		AFTER FIRING 125 RD/MIN TEST*					
1	6.4 Right 13.0 Below	2.4	1.1	1.8	5.9	6.4	7.1
2	5.6 Right 14.2 Below	2.1	1.4	1.2	5.8	5.0	6.4
3	3.8 Right 14.2 Below	2.5	1.7	1.6	6.2	5.0	7.0
4	6.4 Right 12.6 Below	3.7	2.4	2.4	7.9	7.3	10.0
Average	5.6 Right 13.5 Below	2.7	1.6	1.8	6.4	5.9	7.6

* A total of 3679 rounds were fired at a rate of 125 rounds per minute.

Weather data by APG Weather Station

ACCURACY TEST

DATE: 9 and 11 February 1955
FIRED FROM: Mount, Tripod, Springfield Armory Model
WIND: 9 Feb. - SSW , 14 mph.
11 Feb. - SSW, 24 to 35 mph.
TEMPERATURE: 31 to 43° F.
RANGE: 100 Yards
Direction of Fire: S
SKY CONDITION: 9 Feb. - Clear
11 Feb. - Overcast with light rain.
CARTRIDGE : Ball, Caliber .30, T104E2, Lot FA X30-2200
GUN: Machine, Light, Caliber .30, T161E2, SERIAL NO. 19
RIFLEMAN: Davis

Target measurements are given in inches.
Ten-round targets were fired single shot.

TARGET NUMBER	C.I. FROM CENTER OF TARGET	MR	MVD	MHD	EVD	EHD	ES
		BEFORE FIRING 125 RD/MIN. TEST					
1	0.0 Right 4.1 Above	2.4	1.6	1.2	8.2	5.7	8.2
2	0.7 Right 3.8 Above	2.8	2.1	1.5	8.9	6.1	10.7
3	1.2 Right 3.1 Above	1.7	1.2	0.8	6.7	3.3	6.9
4	1.6 Right 2.7 Above	2.6	1.2	1.9	7.8	5.9	8.4
Average	0.9 Right 3.4 Above	2.4	1.5	1.4	7.9	5.2	8.6
		IMMEDIATELY FOLLOWING COMPLETION OF 125 RD./MIN. TEST					
	2.4 Right 14.0 Below	3.3	2.3	2.0	7.1	8.7	9.5
		AFTER FIRING 125 RD./MIN. TEST					
1	0.9 Right 18.8 Below	2.0	1.4	1.1	6.7	5.8	6.9
2	0.7 Right 17.2 Below	2.1	1.4	1.4	6.3	5.5	6.4
3	0.2 Left 15.2 Below	2.2	1.4	1.3	7.3	5.2	7.5
4	2.2 Left 15.2 Below	2.3	1.4	1.6	6.0	7.3	7.5
Average	0.8 Left 16.6 Below	2.2	1.4	1.4	6.6	6.0	7.1

Weather data by APG Weather Station

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APPENDIX C

APG Photographs

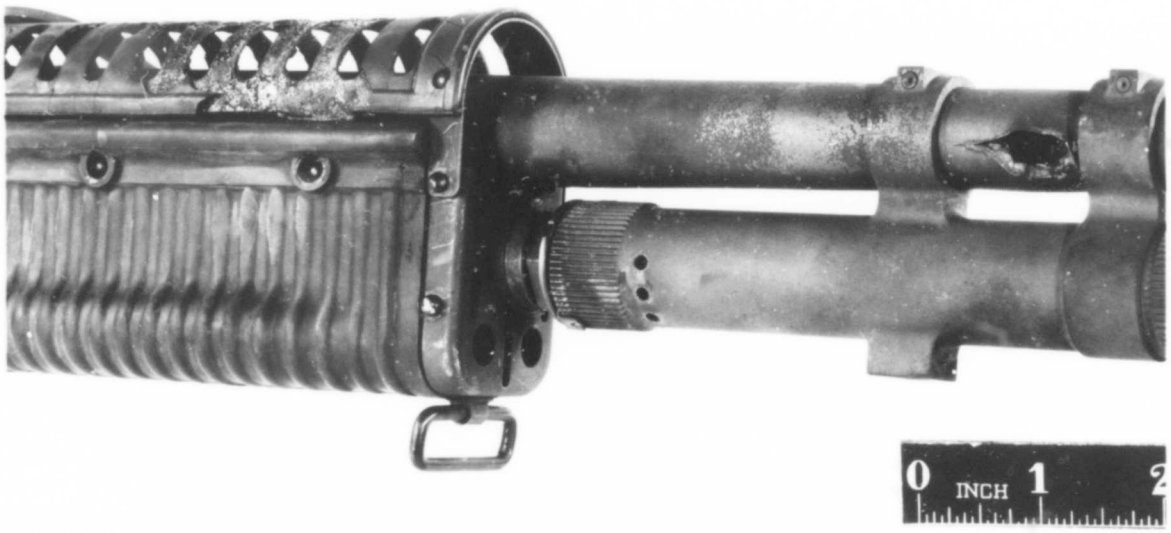
Numbers

B5532
B5531
B6437
B6438

CONFIDENTIAL

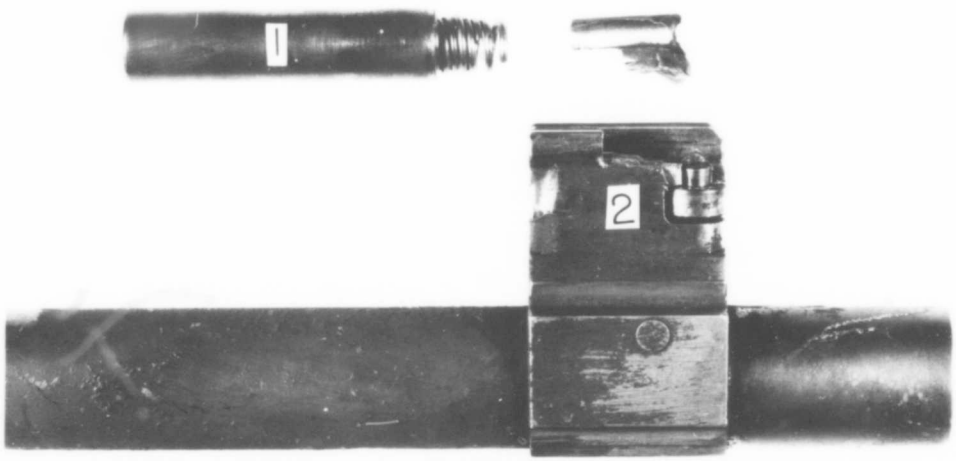
B5532 CONFIDENTIAL ABERDEEN PROVING GROUND 5 January 1955

Project No. TS2-2023. Gun, Machine, Light, Caliber .30, T161E2. Barrel damaged in firing 1699 rounds at a rate of 250 rounds per minute.



Project No. TS2-2023. Gun, Machine, Light, Caliber .30, T161E2. Barrel damaged in firing 3574 rounds at a rate of 125 rounds per minute.

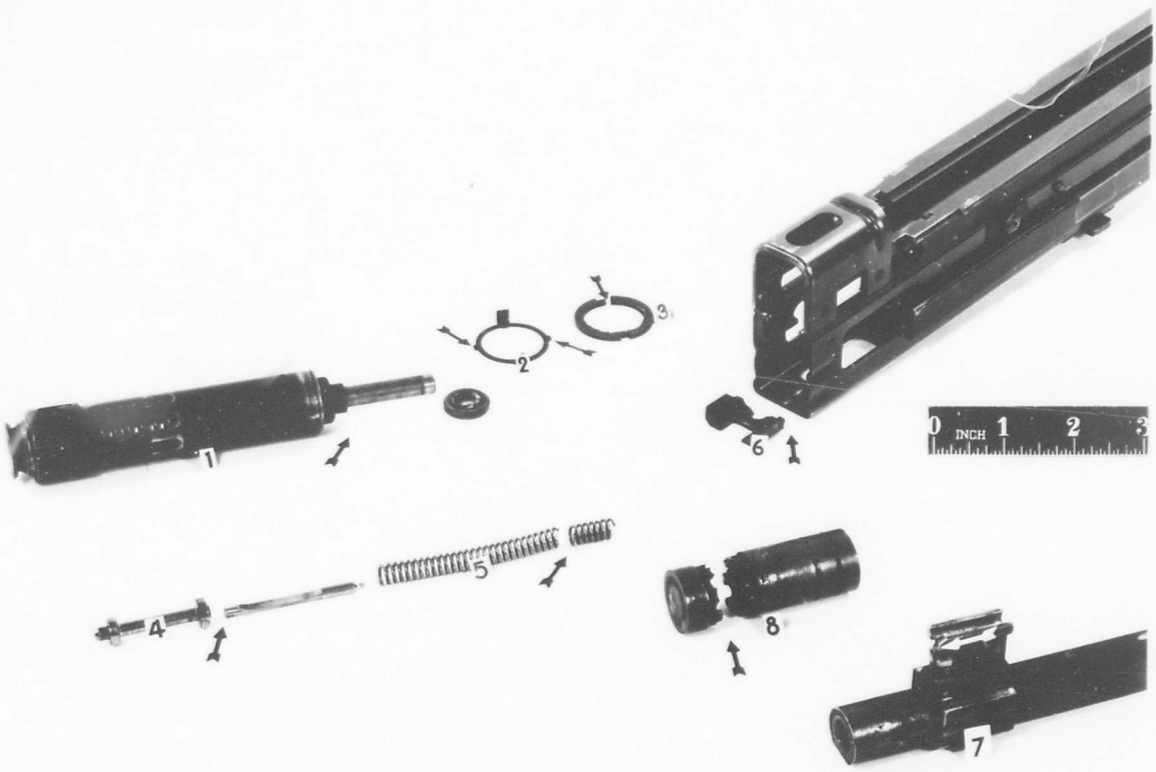
CONFIDENTIAL



B6437 [redacted] ABERDEEN PROVING GROUND 15 February 1955

Project No. TS2-2023. Gun, Machine, Light, Caliber .30, T161E2. Parts from gun, serial number 17, which broke in firing a barrel-performance test are (1) firing pin spring and (2) operating rod yoke.

CONFIDENTIAL



B6438 [redacted] ABERDEEN PROVING GROUND 15 February 1955

Project No. TS2-2023. Gun, Machine, Light, Caliber .30, T161E2. Parts from gun, serial number 19, which broke in firing a barrel-performance test are (1) buffer cap, (2) gas cylinder nut lock, (3) gas cylinder nut washer, (4) firing pin, (5) firing pin spring, (6) lower rail, (7) operating rod yoke and (8) piston.